Parboiling of Rice

Concept of parboiled Rice

Parboiled rice (also called converted rice) is rice that has been partially boiled in the husk.

The three basic steps of parboiling are soaking, steaming and drying. These steps also make rice easier to process by hand, boost its nutritional profile and change its texture. About 50% of the world's paddy production is parboiled. The treatment is practiced in many parts of the world such as India, Bangladesh, Pakistan, Myanmar, Malaysia, Nepal, Sri Lanka, Guinea, South Africa, Italy, Spain, Nigeria, Thailand, Switzerland, USA and France.

Rice is easier to polish by hand (removal of the bran layer) after parboiling but mechanical processing is harder since the bran becomes somewhat oily and tends to clog machinery. Most parboiled rice is milled in the same way as white rice.

Parboiling drives nutrients, especially thiamin, from the bran to the endosperm, hence parboiled white rice is 80% nutritionally similar to brown rice. Because of this, parboiling was adopted by North American rice growers in the early 20th century.

The starches in parboiled rice become gelatinized, then retrograded after cooling. Through gelatinization, amylose molecules leach out of the starch granule network and diffuse into the surrounding aqueous medium outside the granules which, when fully hydrated are at maximum viscosity. The parboiled rice kernels should be translucent when wholly gelatinized. Cooling brings retrogradation whereby amylose molecules re-associate with each other and form a tightly packed structure. This increases the formation of type 3-resistant starch which can act as a prebiotic and benefit good health in humans. However,

this also makes the kernels harder and glassier. Parboiled rice takes less time to cook and is firmer and less sticky. In North America, parboiled rice is either partially or fully precooked before sale. Minerals such as zinc or iron are added, increasing their potential bioavailability in the diet.

The Basic Process of Parboiling

The process of parboiling begins before the hulling process.

Step 1- The grain is soaked in water: The traditional parboiling process involves soaking rough rice overnight or longer in water followed by boiling or steaming the steeped rice to gelatinize the starch. Modern methods involve the use of hot-water soak for a few hours.

Step 2- The soaked grain is then steamed: Parboiled rice is steamed before removal of husk. The steaming helps the rice to soak nutrients and change the starch composition making it firm and less sticky than regular white rice.

Step 3- The steamed rice is then dried for hulling: The parboiled rice is then cooled and sun dried before storage and milling.

Parboiling gelatinize the starch granules and hardens the endosperm, making it translucent.

Huzenlaub Process

In older methods, clean paddy rice was soaked in cold water for 36–38 hours to give it a moisture content of 30–35%, after which the rice was put in parboiling equipment with fresh cold water and boiled until it began to split. The rice was then dried on woven mats, cooled and milled.

In the 1910s German-British scientist Erich Gustav Huzenlaub (1899–1964) and the British scientist and chemist Francis Heron Rogers invented a form of parboiling which held more of the nutrients in rice, now known as the Huzenlaub

Process. The whole grain is vacuum dried, then steamed, followed by another vacuum drying and husking. This also makes the rice more resistant to weevils and lessens cooking time.

In even later methods the rice is soaked in hot water, then steamed for boiling which only takes 3 hours rather than the 20 hours of traditional methods. These methods also yield a yellowish color in the rice, which undergoes less breakage when milled.

Advantages of parboiling

1. The process imparts a hard texture and a smooth surface finish to the grain as a result which the brokens in the milled rice is minimized. While 90% of the parboiled grains may remain unbroken; the brokens in raw rice could be as high as 50%. The reduction in broken rice results in an increase of 3-5% in the total yield of rice.
2. Insects find it more difficult to bite and eat their way through the hard and smooth surface of parboiled rice.
3. The loss of solids in the gruel during cooking is also less in parboiled than in raw rice.
4. Milled parboiled rice contains more of B-vitamins than milled raw rice.
5. Loss of B-vitamins is less in parboiled rice, during washing and cooking, compared to that in raw rice.
6. The cooking quality is different from that of raw rice. Parboiled rice is non-sticky and non-glutinous.
7. The parboiled paddy on milling produces a bran higher in oil content (about 25-30 % oil) compared to raw rice bran (about 10-20 % oil).

8. Parboiled rice bran is relatively stabilized compared to raw rice.

9. It's rich in minerals as it contains 3% of calcium, potassium, zinc, iron and magnesium which if consumed on a daily basis is very beneficial for the body.

10. It loses less starch during cooking. Once cooked, it stands for long times and stays fluffy.

11. This rice is heaven for diabetics as it has low glycemic index meaning the food gets converted to sugar very slowly thereby keeping the sugar levels low.

Disadvantages

1. It almost doubles the total processing cost as bran removal is more difficult which costs more.

2. Longer cooking times mean more usage of fuel.

3. It develops a darker color compared to raw rice.

4. It has more chances of developing rancidity because of the loss of natural antioxidants during parboiling.

5. Due to long soaking in traditional process, some mycotoxins may develop and cause health hazards.